

low lands and the *Chattahoochee* at Gainesville, Ga., on the 16th, overflowed, causing much damage to crops, fences and bridges. Since printing the table of heights of rivers on chart No. III the reports received from Portland, Oregon, give the height of water in the Columbia river: highest, 3rd, 5 ft. 6 in.; lowest, 22nd and 23rd, 1 ft. 4 in.

Ice in Rivers and Harbors.—The following notes on the breaking up of ice, &c., and opening of navigation are reported by observers: *Yellowstone River.*—Fort Keogh, Mont., 23rd, ice broke up. Fort Buford, 24th, ditto. *Missouri River.*—At Fort Buford, Dak. T., the river below the mouth of the Yellowstone broke up on the 26th and above on the 28th. Fort Stevenson, ice broke up on the 29th, Bismarck, 30th, Fort Yates, 30th, 1:30 p. m. Omaha, ice disappeared on the 20th. Plattsmouth, river open on the 2nd, closed on the 14th, and open again on the 20th. *Dakota River.*—Morrison, ice disappeared on the 25th. *Mississippi River.*—St. Paul, ice broke up on the 26th, but remained gorged until the 29th. La Crosse, 6th, river open; 14th to 18th, river frozen above city; 12th, first steamboat arrived from below. Davenport, 1st to 18th, floating ice. Keokuk, from 1st to 17th, floating ice. Burlington, 17th, river clear of ice. *Rock River.*—Rockford, Ill., 14th and 15th, frozen over. *Des Moines Rapids Canal.*—8th, open. *Lake Superior.*—Duluth, harbor closed entire month; 31st, the ice was two feet thick and extended out about thirty miles. Marquette, 24th, the ice in the bay over two feet thick. *Lake Huron.*—Alpena, 8th, steamer left port, but had to return, and was ice-bound until the 23rd; river frozen until the 30th. Port Huron, 18th, first boat from Toledo. *Lake Michigan.*—At Escanaba navigation closed: bay frozen throughout month. At Northport the bay continues low; navigation opened on the 31st. Milwaukee, 13th and 14th, ice around pier. *Detroit River.*—Detroit, first steamer left on the 9th: 13th to 19th, river full of floating ice. *Lake Erie.*—Toledo, coasting scows running on the 2nd; first steamers and schooners left on the 13th. Buffalo, 19th, first vessels arrived. Sandusky, 8th, first vessel left port. Cleveland, 9th, first steamer arrived. *Lake Ontario.*—Rochester, 23rd, first vessel arrived; Oswego, 21st, ditto. Catawissa, Pa., 17th, North Branch of Pennsylvania canal opened for navigation. *Otsego Lake.*—Cooperstown, N. Y., lake open on the 5th, but closed again on the 9th. *Hudson River,* Albany, 1st, river open to New York; 10th, first steamer left for New York. *Lake Champlain.*—Burlington, 6th, lake open; 23rd, temporarily frozen over; 29th, Shelburne Bay, south of city, still closed with heavy ice; 29th, first steamer left for Plattsmouth. *Lake Massachusetts.*—Auburn, N. H., 31st, about half free of ice.

High Tides.—Atlantic City, 29th; Portsmouth, N. C., 10th, 29th; Indianola, Tex., 21st, 22nd.

Low Tides.—Baltimore, 25th.

TEMPERATURE OF WATER.

The *temperatures of water* as observed in rivers and harbors, with average depth at which observations were taken, is given in the table on the left side of chart No. II. At the following stations observations were not made on the dates indicated on the account of ice:—Duluth, Escanaba and Marquette throughout the month; Alpena, 1st to 29th; Milwaukee, 13th and 14th; Detroit, 13th to 19th; Burlington, 1st to 7th and 9th to 28th. On account of breakage of thermometer no observations were made at Alpena on 30th and 31st; at Eastport from 10th to 31st; at Milwaukee from 28th to 31st; at New York City, from 1st to 7th and 19th to 25th, and at San Francisco from 1st to 13th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms—were reported in the various districts as follows: New England, 5th; Middle Atlantic States, 4th, 5th, 22nd, 23rd, 26th to 28th; South Atlantic States, 5th, 6th, 13th to 16th, 18th, 27th, 28th; Gulf States, 8th to 16th, 18th, 19th, 27th, 28th, 31st; Tennessee and the Ohio valley, 3rd to 6th, 11th, 12th, 16th, 23rd, 25th to 29th, 31st; Lake region, 3rd to 5th, 27th; Upper Mississippi and Lower Missouri valleys, 2nd to 6th, 25th to 27th, 31st; California, 3rd at Sacramento and Visalia, 14th at San Diego.

Auroras.—Isolated cases of aurora are reported as follows: 1st, Pembina, Dak.; 3rd, Oregon, Mo.; 8th, Nora Springs, Iowa; Manitowoc, Wis., 9th, 10th, dark segment with "merry dancers;" 9th and 21st, Frankfort, Mo.; 16th, Starkey, N. Y.; 10th, Orono, Me.; 15th, Ft. Stevenson, Dak., ranging from 60° N. to 60° W.; the beams had a quick lateral motion and were most brilliant about 3 a. m. of the 16th; the beams displayed the greatest brilliancy and altitude when due north, sometimes reaching the zenith; 16th, aurora similar to the 15th though not so brilliant; Ft. Sisseton, Dak., 21st, 8 to 11 p. m.; Williamstown, Mass., 30th. On the 12th at Burlington, Vt., 11:15 p. m., and Eastport, Me., 11:45 p. m.; color, pale yellow, few streamers, no dark segment. Starkey, N. Y., 8 p. m. On the 13th an aurora was observed from Eastport, Me., to Ft. Sisseton, Dak., except where cloudy weather prevented observations. The following descriptions are reported: At Eastport, Me., faint, and of pale yellow color; it began at 11:45 p. m. of the 13th, and ended at 3:00 a. m. of the 14th. At Burlington, Vt., seen for a few minutes through a rift in clouds, and was observed to be faint. Pembina, Dak., "very brilliant aurora at 7 p. m. of the 13th, and continued into the night. The whole northern sky was more or less illumined and the light emitted was almost equal to the moon at the full. A broad arch of light, very bright but rather ill-defined, extended 170° to 270° azimuth, and sometimes reached the zenith. There was a good deal of movement, but it was rather slow and the eye had some difficulty in detecting it. There was also some striated lines of light crossing the arch but nothing like "merry dancers." A peculiarity of this aurora was a number of large whorls of nebulous light, like the large nebula in Canes Venatici, which appeared at several points along

the arch and also beneath it. These whorls were constant as to duration, but not as to position, as they constantly changed the latter, but were at no time entirely absent. There was very little variety of color, the only deviation from white being some faint traces of greenish yellow which occasionally appeared in the whorls. Ft. Sisseton, 7 to 11 p. m., very bright. The display of the 17th is interesting from its unusual extent and brilliancy. It was observed from Eastport, Me., to Fort Benton, Dak., except in sections where cloudy weather prevailed. The most southerly station reporting was Somerville, N. J., where it was faint. The following are the other stations reporting it: in *Maine*, Orono, Bangor and Gardiner; *New Hampshire*, Grafton; *Massachusetts*, Newburyport, Boston, Springfield, Williamstown and Fall River; *Connecticut*, New Haven and New London; *New York*, Madison Barracks, North Volney, Palermo, Oswego and Lima; *Pennsylvania*, Catawissa; *Ohio*, Toledo; *Michigan*, Detroit, Lansing and Alpena; *Wisconsin*, Manitowoc; *Dakota*, Pembina. It is described as follows: Bangor, Me., from 11:05 till 3 a. m., greatest brilliancy at 12:30 a. m.; extent, from 120° to 140° azimuth; greatest altitude, 37° ; peculiarity, slender luminous beams, "merry dancers" and dark segment, color brilliant yellow. Eastport, from 9 p. m. to 3 a. m. of the 18th, extending from NW. to NE.; altitude, 40° ; peculiarities, an arch with six luminous beams shooting upwards; color, straw. Springfield, Mass., 9:30 to 10:30 p. m.; very brilliant, dark arch, altitude 18° , with "merry dancers" shooting up to altitude of 30° . New Haven, Conn. Appeared at 8 p. m. It consisted of an arch of white light, measuring 12° of altitude and 40° of azimuth, with a dark-colored segment below the arch, the segment below the arch, the segment being so dark as at first to be mistaken for a cloud. Between 8 and 9 p. m. streamers of quivering white light shot upwards nearly to the zenith. The display lasted until daylight of the 18th, and would doubtless have been very brilliant but for the moon, which shone brightly during most of the time. Oswego, N. Y., from 11 p. m. till after midnight; azimuth, 50° ; altitude, 5° ; a luminous arch resting on dark segment; changes slight. Grafton, N. H., "first appeared at 7:20 p. m., continuing until 4 a. m. 18th. Streamers appeared at 9:30 p. m., reaching their greatest brilliancy at 10 p. m., having an altitude of 70° and a quick motion from east to west, bearing north. From 10 p. m. to 1:30 a. m. of diffuse white color, intermixed with patches of dark segments, reaching at latter hour an altitude of 40° , which was mainly the altitude of the aurora during the rest of the night. At 1:35 a. m. the aurora had a dancing motion, up and down, with the rapidity of lightning. From this time until the end, the aurora was mainly of a diffuse white, with patches of dark segment mixed in. The aurora was observed all around the horizon. The patches of dark segment had a slow lateral motion from W. to E. No dark clouds below the arch observed." Pembina, Dak., the aurora appeared at 7 p. m. It would probably have been brilliant, but for the influence of the moonlight, but as it was, the display was rather pale. It extended from about 175° to 260° azimuth, and at times almost reached the zenith. There were three arches of light of very unequal brilliancy, the upper one being generally brilliant. Occasionally, rays of light started from the lower arch and reached across the upper one, and remained for a time with a tremulous motion. Those rays generally preceded the breaking up of the upper arch into hazy nebulous masses, which soon afterwards disappeared, while a new arch was developed beneath the others. After 10 p. m. there was only one arch visible, and at 11:30 p. m. it had nearly disappeared. North Volney, N. Y., streamers soon changing to striated mass.

Telegraphic Communication interrupted by Atmospheric Electricity.—Socorro, N. M., 2nd and 26th; Dodge City, Kan., 4th, severe electric storm, telegraphic instruments could be worked without battery at times, the air was filled with floating sand; Decatur, Tex., 26th; Castroville, Tex., 11th and 21st; Mason, Tex., 2nd, 7th and 26th.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service Stations. Reports from 135 stations show 4,108 observations to have been made, of which 23 were reported doubtful; of the remainder, 3,347 or 81.9 per cent. were followed by the expected weather.

Zodiacal Light.—Southington, Conn., 5th, 8th, 10th, 30th. *Indiana*, New Corydon, 1st, 2nd, 5th, 28th, 29th, 30th; Wabash, 1st, 5th, 8th, 29th. *Iowa*, Cresco, 5th, 9th, 11th; Monticello, 1st, 3rd, 5th, 8th, 9th, 11th, 28th; Ft. Dodge, 1st, 5th, 28th, 29th. *Kansas*, Cedar Vale, 1st, 3rd, 4th, 7th, 10th, 27th, 30th; Yates Center, 1st, 7th, 28th, 30th, 31st. *Massachusetts*, Harvard College, Cambridge, 2nd, (4th at 8:30 p. m., Gamma Arietis and Zeta seemed to be on opposite borders of the light); 5th, 8th, 10th, distinct, perceptible on the 12th, other nights moonlight or cloudy; Rowe, 2nd, 6th; Somerset, 1st, 2nd, 4th, 5th, 6th, 8th, 10th, 30th, 31st. *Missouri*, Oregon, 1st to 4th, 7th to 10th, 28th to 31st. Clear Creek, Nebr., 1st, 8th, 28th. Freehold, N. J., 1st; Atco, N. J., 1st, 2nd, 5th, 10th, 31st; Waterburg, N. Y., 2nd, 4th, (6th, bright), 8th, 11th, (30th, bright), 31st; Ithaca, N. Y., 31st; Bellefontaine, Ohio, 1st, 2nd, 30th, 31st; Dyberry, Pa., 10th; Coalville, Utah, 4th; Wytheville, Va., 2nd, 4th, 5th, 9th, 29th, 31st; Dubuque, 11th; New Haven, Conn., 2nd, 6th, 8th, 30th; Lynchburg, Va., 26th, 29th, 30th, 31st; Mr. Chas. Hasselbrink, observer at Havana, Cuba reports as follows, from March 27th; 27th visible from 7:15 to 7:50 p. m., "light rises almost vertically and vanishes in the region about Omega Taurus; at beginning of observations noted a luminous band which extended horizontally as far as Cassiopeia"; 31st visible from 7:15 p. m., not very bright or extensive. Pleiades 30° above the horizon formed the vertex of the triangle of the light. Intermittence in brightness less sensible than in former observations.